AMENDMENT TO THE SPECIFICATION

Please rewrite the paragraph beginning at line 7 of page 1 as follows:

The present application has some Figures in common with, but is not necessarily otherwise related to, the following application(s), which are commonly owned with and have the same effective filing as the present application, and which are all hereby incorporated by reference:

Appl.No. 10/040,301 filed 10/26/2001 (Atty. Docket SC-00-10);

Appl.No. 10/040,927 filed 10/26/2001 (Atty. Docket SC-00-11);

Appl.No. 10/035,350 filed 10/26/2001 (Atty. Docket SC-00-12);

Appl.No. 10/040,304 filed 10/26/2001 (Atty. Docket SC-00-13);

Appl.No. 10/040,294 filed 10/26/2001 (Atty. Docket SC-01-03); and

Appl.No. 10/040,928 filed 10/26/2001 (Atty. Docket SC-01-04).

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The paragraph beginning at line 3 of page 6 is sought to be rewritten as follows:

a3

~~Figure 16 shows~~ Figures 16A and 16B show a drill string and sensor placement on an instrumented sub.

The three consecutive paragraphs which begin at line 19 of page 27 are sought to be rewritten as follows:

a4

This class of example embodiments demonstrating innovations of the present application are herein referred to as the Mean Strain Ratio Analysis (MSRA) method. Though the innovations are described using the particular examples given, it should be understood that these examples do not limit the implementation of the innovative ideas of this application. In an exemplary embodiment of this method strain measurements taken from an instrumented sub directly above the bit are used to detect changes in induced bending and axial stresses which are related to a roller cone bearing failure. In one embodiment, the strain gauges are located 120° apart around the instrumented sub (though this is not

required, and asymmetric arrangements work as well, as discussed below). ~~Figure 16 shows~~ Figures 16A and 16B show the placement of the strain gauges in a sample embodiment.

~~Figure 16 shows~~ Figures 16A and 16B show a drill string with a sub assembly **1602** and drill bit **1604**. The cross sectional view (along A_A) shows the placement of strain gauges **1606**, here shown as symmetrically distributed around the sub 1602. Of course, the strain gauges 1606 need not be symmetrically placed, since failures are detected by relative changes in the readings.

a4

There is an average percentage of the total load on the bit that each of the cones on a roller cone bit will support. The axial strain detected at one of the strain gauge locations shown in ~~Figure 16~~ Figures 16A and 16B will depend on three main factors. These are the location of the strain gauge relative to the cones on the bit in the made up BHA, the weight on the bit, and the bending load produced by eccentric loading on the cones. Other factors can also produce axial strain components but less significantly than those noted above. The strain gauges are not set up to measure torsion-induced shear strains. As one cone in the bit begins to fail, the average share of the total load on the bit that the failing cone can support will change. This change will cause a change in the bending strain induced by the eccentric loading on the cones. When a bit is new (i.e. no bearing failure), the average amount of strain measured by each strain gauge in ~~Figure 16~~ Figures 16A and 16B will maintain a fairly constant percentage of the average strain in each of the other strain gauges. In other words, if an average value of strain for each of the strain gauges is computed, then divided by a similar average strain value for each of the other strain gauges, this ratio will remain fairly constant, even if the load on the bit is varied. However, when the percentage of the load changes as an individual cone wears faster than the other cones or suffers dramatic bearing wear, the ratio of the average strain at each of the strain gauge locations will change. These ratios can

94 be defined as:

The paragraph beginning at line 15 of page 23 is sought to be rewritten as follows:

Failure can be detected in a number of ways, depending on the particular application and hardware used. As an example, failure can be detected by observing a threshold for the spectral energy distributions.
NE 95 When the spectral energy threshold is exceeded ~~exceed~~ a given number of times, or when the threshold is exceeded with a high enough frequency, a failure is indicated.

The paragraph beginning at Line 16 of Page 46 is sought to be rewritten as follows:

Though the signalling embodiments disclosed herein for notifying the operator of the sensor calculations and/or results prefer a reduction of mud flow impedance (i.e. opening a valve from the drillstring interior
96 into the well bore) over a restriction of mud flow (closing a valve), ~~vlavle),~~ restriction of mud flow is a possible method within the contemplation of the present innovations.